Math 115
Worksheet Section 1.5

Important remark: In this worksheet, all the angles under consideration are in *radians*.

Problem 1. Answer the following questions in terms of A, B, C. If you are stuck, try first with $C = 0, A = 1, B = 1$.

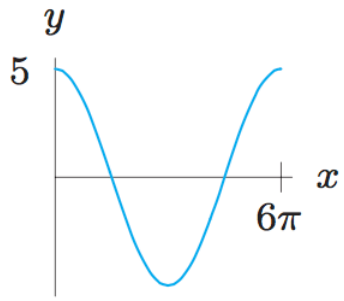
(a) The sinusoidal function $f(t) = C + A\sin(Bt)$ has amplitude _____ and period _____.

(b) The sinusoidal function $g(t) = C + A\cos(Bt)$ has amplitude _____ and period _____.

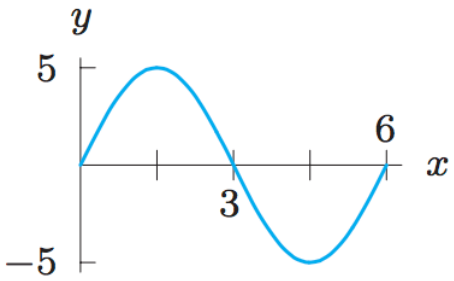
(c) How would I triple the amplitude of $\sin(x)$? Double the period of $\cos(x)$?

(d) $C + A\cos(0) =$_____ and $C + A\sin(0) =$_____.

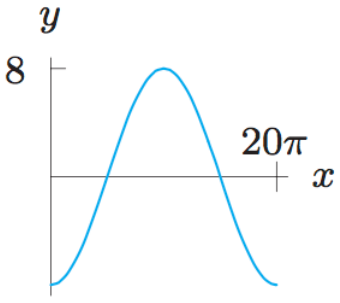
Problem 2. Find a possible formula for each of the graphs below.



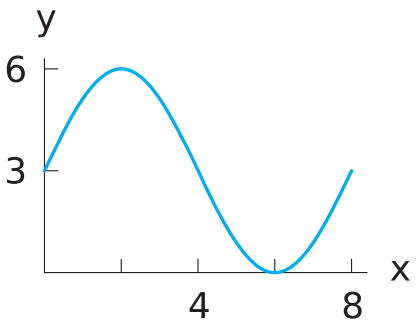
(a)



(b)



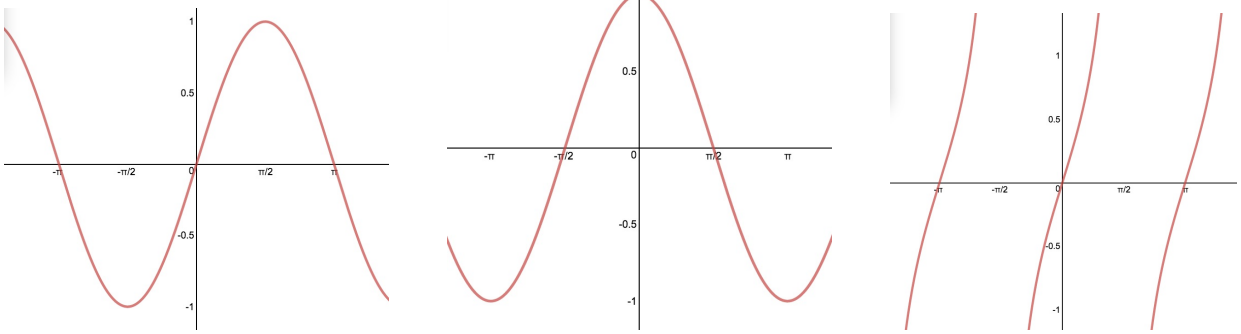
(c)



(d)

Problem 3. The desert temperature, H, oscillates daily between 40°F at 5am and 80°F at 5pm. Write a possible formula for H in terms of t, measured in hours from midnight. Draw a graph of $H(t)$. What are the period and amplitude of $P(t)$?

Problem 4. $\sin(t)$ $\cos(t)$ $\tan(t) = \frac{\sin(t)}{\cos(t)}$



(a) How many solutions can you find on the graph above to $\sin(t) = 0.5$?

(b) Estimate them (roughly – you can use that $\pi \approx 3$ if you like).

(c) How are these solutions related to each other, and how would you find more solutions?

(d) Which of these solutions gets the special name "arcsin(0.5)?"

(e) Repeat parts (a)–(d) for both $\cos(t) = 0.5$ and $\tan(t) = 0.5$

(f) (1.5 #27, 31) Find a solution for each of the following equations, if possible:

$$2 = 5\sin(3x) \qquad 8 = 4\sin(5x)$$

Problem 5. (Winter 2012 Exam 1 Problem 7) Enjoying breakfast outdoors in a coastal Mediterranean town, Tommy notices a ship that is anchored offshore. The ship is stationed above a reef which lies below the surface of the water, and a series of waves causes its height to oscillate sinusoidally with a period of 6 seconds. When Tommy begins observing, the hull of the ship is at its highest point, 20 feet above the reef. After 1.5 seconds, the hull is 11 feet above the reef.

(a) Write a function $h(t)$ that gives the height of the ship's hull above the reef t seconds after Tommy begins observing.

(b) According to your function, will the hull of the ship hit the reef? Explain.